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Marie Davidová and Kateřina Zímová

COLridor

Co-design and co-living urban adaptation

Abstract

The mission of the present trans-disciplinary community environmental project COLridor (Davidová, 2017b) is to generate a situation of eco-systemic co-living across local species and the abiotic agency in an urban environment through their co-design. Located in the city centre of Prague, the case study bio-tope is part of larger bio-corridor that has evolved, namely due to the adjacent railway and water stream. Though the prevailing opinion of European urbanists is that cities should remain dense and separate from the rest of nature, landscape ecologists and biologists tend to disagree. There is no nature on Earth without human beings, and these together evolved, reflecting each other's impacts and interactions. Therefore, there is also no social justice without the environmental one and vice versa. A large variety of species have adapted and evolved for life in the urban environment, which at the moment for many, offers a safer and more habitable living environment than agricultural land with its herbicides, pests, antibiotics and antibiotic-resistant bacteria. Through systematically co-designed and co-created so-called eco-systemic 'prototypical urban interventions' (Doherty, 2005), the project aims to motivate the generation of an edible landscape and a social, cultural and habitable urban environment across species. It is claimed here that designers should no longer be designing for but rather designing with the overall eco-system. This case study helps justify the first author's ratified design field Systemic Approach to Architectural Performance, covering a fusion of a variety of co-designs across the eco-system in process-based fields.

This is an extended, edited and updated article based on the working paper 'COLridor: Co-Design and Co-Living for Sustainable Futures' (Davidová & Zímová, 2017) for Relating Systems Thinking and Design 6 Conference within the theme 'Environment, Economy, Democracy: Flourishing Together' (Sevaldson, 2017a).

Keywords: Systemic Approach to Architectural Performance; Eco-Systemic Agency; Systems Oriented Design, Performance Oriented Design; GIGA-Mapping, Eco-Systemic Urban Interventions; Eco-Systemic Co-Design; Landscape Ecology; Biodiversity; Climate Change Adaptation; Public Engagement; Responsive Wood.

Introduction

The old garden of the loghouse Zvonařka with adjacent Nusle Stairs is Prague's nature-like bio-tope¹ with remarkable diversity (see Figure 1), and along with the adjacent railway, parks and gardens, it generates a rare bio-corridor² within the city centre. As it is located in one of the most expensive residential areas, the pressure on its building development is high. In 2011, a large apartment complex design was submitted for permit, arguing '*for keeping the greenery character due to its green roofs*' (RH-Arch, 2011). This induced vast community protests as both the house as well as the garden are listed as historical heritage. Furthermore, it covers '*eco-systemic services*' in the location (see Figure 1). There is evidence that human life cannot exist without these services (Sandhu & Wratten, 2013); however, neither the previous nor a recently proposed metropolitan plan lists the area for protection (Institute of Planning and Development Prague, 2016). Based on a personal conversation with its creators, the Institute of Planning and Development Prague is interested in increasing the city's density, not extending its bio-corridors and bio-diversity within the city centre. This plan is neither co-designed with

ecologists nor with local communities or Non-Governmental Organisations (the finalised version is available for commenting or complaints without any commitment to change). Purely urbanists, marking the areas in the plan from their tables, without investigating the areas, have created it. As also confirmed by the Concept of Metropolitan Plan Justification, the plan does not consider ‘details’ (Kubeš et al., 2014). It also states that due to being behind the range of land planning, the design is not in accordance with the European Commission’s strategy of Green Infrastructure (European Commission, 2010). Instead, the term ‘Landscape Infrastructure’ is used (Kubeš et al., 2014). This term is not in accordance with the complexity of the strategy, while, as mentioned, contributions from disciplines other than from urbanists and local communities are fully excluded.



Figure 1. The first author is giving a speech on Bio-Corridor’s importance during the local community meeting at Nusle Stairs (photo: Micháľková 2016).

It is argued that the recent common understanding of eco-systemic services should be revised. The authors agree with Metzger, who stated that the Ecosystem Services Approach is currently based on a thoroughly modernist conception of the world (Metzger, 2017). Eco-systemic services are perceived mainly from an anthropocentric perspective, mapping only the performance that is directed towards humans, such as a park with grass cut to a two-centimetre height for good picnicking and all its biological rotten waste from trees, for example, is removed due to hygienic or safety reasons. This does not provide any eco-systemic services for the majority of actors within the eco-system. As such, it does not offer any nutrients, habitation or even opportunities for relaxation for any species other than the human species.

Investigating this discussion, the first author's, at that time, purely architectural NGO Collaborative Collective (Collaborative Collective, 2012, 2016; Davidová, 2018) organized through an arranged cooperation with the second author's ecology support and evaluation focused NGO CoolAND (CoolAND, 2016a, 2016b) the first ecological pre-study of the locality (Zímová, 2016). This pre-study served for reasoning of the eco-systemic support envisioned community project's relevance. And it was used to start building on the project and for submitting a detailed investigation proposal for funding.

In the spring semester of 2017, the fully transdisciplinary systems oriented co-design project began among the Faculty of Art and Architecture at TU of Liberec Faculty of Forestry and Wood Sciences, the local community and the local environment, with the leadership by Collaborative Collective and CoolAND (see Figure 2). This ‘*GIGA-mapping*’ (Sevaldson, 2011, 2015) and ‘*full scale realisation prototyping studio*’ (Davidová & Sevaldson, 2016) focuses on supporting the local bio-tope by building shelters for the habitats of bats, insects, homeless people, etc. The design process, prototyping and further local development fully engage the local specific environment⁵ along with the local community. In this sense, it not only involves participation but also co-design⁶. The co-design method involves both biotic and abiotic performative agency within a so-called ‘*Time Based Design*’. Time-based Design was investigated by Sevaldson, focusing at that the project does not end by the building finalisation (Sevaldson, 2004, 2005, 2017b). This paper describes the first steps in this research-design process.

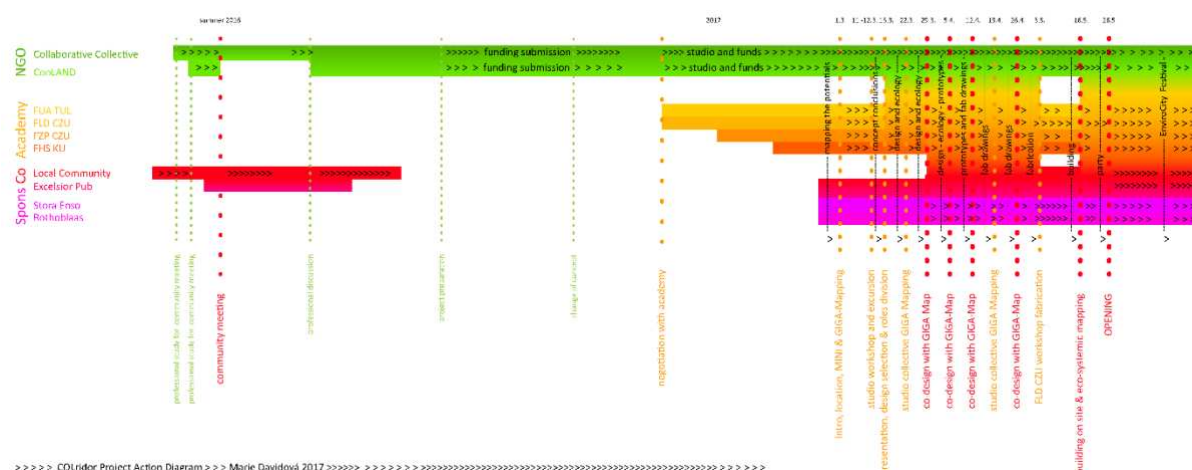


Figure 2. An action diagram showing the integration of the Local Community, NGOs, Academy and Sponsors for Future Co-Design and Co-Living (Davidová 2017).

The project aim is to motivate humans to co-live within the eco-system with other species and with each other across social differences. Massey points out that an aspect of the universalisation of the meaningfulness of place ironically concerns the production of difference. She also states that such struggles over place, and the meaningfulness in and of place, to the argument that in any even minimal recognition of the relational construction of space and of identity, *'place'* must be a site of negotiation, which will often be a conflictual negotiation (Massey, 2004). The common events, such as prototype installations or seed bombs, topic-related lectures and workshops, cultural performances and bat mapping, at the EnviroCity festival (Davidová & Kernová, 2016) did not avoid such problematique. On the contrary, they prompted the discussion. The aim to support the eco-system⁷ through eco-systemic *'prototypical urban interventions'* provoked an unavoidable discussion directly on site due to their generative character, attaining a high impact through small input (Davidová, 2004;

Doherty, 2005); however, none of this was done in an aggressive manner. The strength of the project lies within the search for a balanced, systemic, co-living, real-life performance across stakeholders with highly different interests.

Therefore, due to this bottom up (in combination with top down) approach to the project's performance and its discussions and publication, in less than one year, a new owner bought the property from the one that claimed to have insufficient finances to preserve the precious garden and the log house, thus arguing for commercial development. The new owner claimed it would be refurbished into a new retreat centre for both humans and the biotope. The announcement promises that a health centre that offers psychological, wellness, yoga and other healing services will be built within the log house and that strong, true eco-systemic services for all will be offered within its garden. Similar to the COLridor's project program, it promises bat houses, insect hotels, blossoming gardens, etc., and most importantly, a co-living environment for all.

A similar understanding of cross-species co-living has been presented by feminist Science and Technology Studies (STS) based on the concept of '*caring*' in reference to other species in which different territorial needs and understandings play crucial roles within togetherness (Metzger, 2014); however, the notion of '*caring*', regardless of the complexity of the context it covers (Sevenhuijsen, 1998), appears to operate from a superior perspective as opposed to the discussed co-living and co-design (eco-) systemic performance conditions. This one involves culture, the social environment, habitation and the '*edible landscape*' because urban wildlife is critical to ecosystems (Adams & Lindsey, 2016; Creasy, 2004). Therefore, the aim is to reinterpret and/or to extend and to rethink the commonly perceived mission of architecture and urban design.

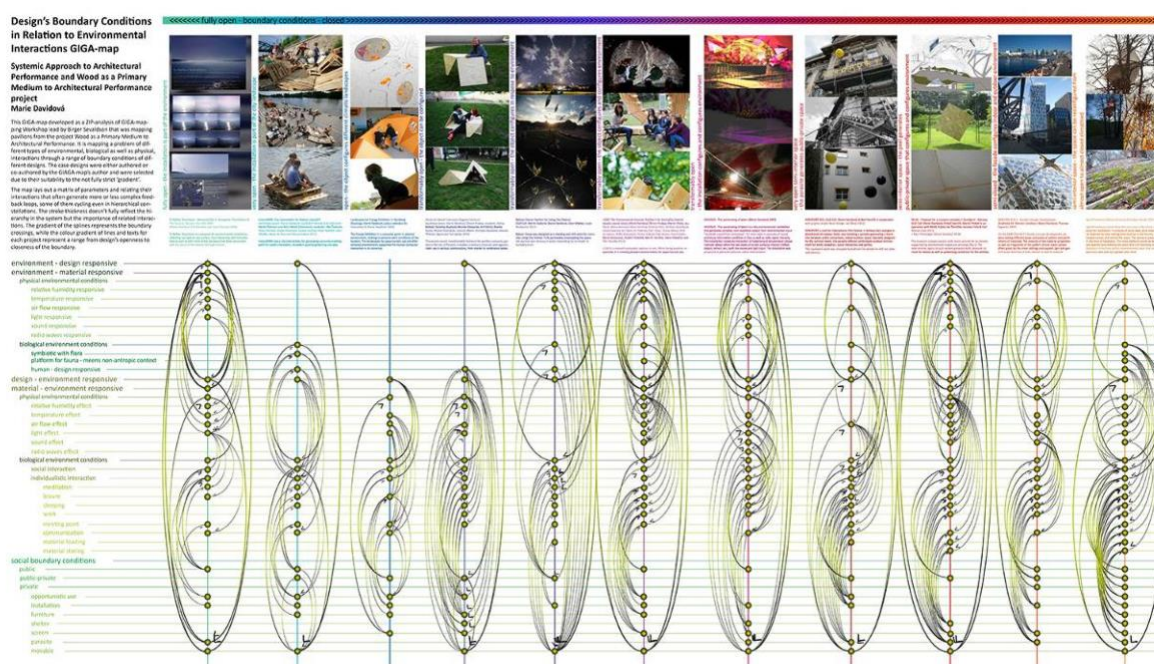


Figure 3. The GIGA-Map involves mapping the architectural performance, graduating the first author's authored and co-authored projects from fully open to almost closed and relating the eco-systemic agency that passes their boundary conditions in feedback loops. The performance was evaluated based on the conclusion that the more trans-agency performance interacting across architectures, the more benefits to human agents (Davidová, 2016b).

Considering the overall agency across the eco-system, this (eco-)systemic '*non-anthropocentric architecture*' (Hensel, 2013, 2015) was concluded by the first author's previous study on performance to also be the most beneficial to humans. These benefits are generated through its performance, its opportunities of use and its sustainability (Davidová, 2016b) (see Figure 3), including opportunities for food, climate comfort, dwelling, intimacy, resting, social interaction and personal as well as common experiences.

Systemic approach to architectural performance methodology driven design field in the COLridor project

While performing Research by Design during full-scale prototyping, the first author developed her own design field. The Systemic Approach to Architectural Performance (SAAP) was ratified in January 2017 as a fusion of process-based fields formally initiated by the integration of '*Systems Oriented Design*' methodology (Sevaldson, 2012, 2013, 2017b) and '*Performance Oriented Architecture*' (Hensel, 2011, 2012, 2013). The approach allows for developing methodology and generating theory through experimental practice. SAAP involves Time Based Eco-Systemic Co-Design, which is performed through both biotic and abiotic agency, including human agents. It belongs to a broader field of Systemic Design while considering the overall eco-system in action. Here, it was achieved through the engagement of eco-systemic '*prototypical urban interventions*' (Doherty, 2005) in public space and thus through interactions with and integration within the (eco)system. The (eco)system is hence co-designed and re-designed along with all interacting agencies involved. As demonstrated, this co-design consists of an efficient mixture and fusion of several types of co-performative processes.

Trans-disciplinary and public based co-design

As mentioned, the project was developed based on an ecological pre-study of the location. Furthermore, community and invited experts attended GIGA-Mapping co-design workshops at a local restaurant. During these workshops, the design and realisation of eco-systemic prototypical urban interventions were co-developed in the forms of an insect hotel, called TreeHugger and various public intervening events of the EnviroCity 2017 Festival, which again, included the GIGA-Mapping workshop by invited lecturers to enrich the processes. The GIGA-Maps were exhibited on-site for the community to interact with them. Following the application, while receiving attention from a variety of communities, the TreeHugger responsive wood insect hotel model code was placed online as an open source, acting as a Christ-Mass present available to communities anywhere in the world. Therefore, the project aim is also to reach local communities and ecologies globally.

GIGA-mapping workshops

Following a series of lectures from each of the specialist team members and a study field trip, the team arranged an initial GIGA-mapping workshop. Though on-site, the first workshop was arranged in an exclusive (not inclusive) setting. Each of the team members, who were from different disciplines, GIGA-mapped their individual field's interests and speculations within the project to search for intersections (see Figure 4). This mapping helped co-organise individual interests to initiate teamwork. Therefore, this event was crucial despite the fact that some of the original members decided to discontinue participation in the project because it did not meet their expectations or required a significantly larger workload than originally expected. While establishing the aims, each participant was asked to print reference pictures of the items they wanted to discuss for the next GIGA-Mapping workshop that was already public. The use of images during GIGA-Mapping also brings tacit, even sub-conscious, layers into play (Davidová, 2016b, 2016d, 2017d; Davidová & Uygan, 2017) and therefore better stimulates Shön's '*reflection in action*' (Schön, 1983) during the design process. This is because the

GIGA-Map has several more dimensions as well as relations within these dimensions. The workshop focused on searching for such, utilising drawing techniques (see Figure 5). The follow-up workshops utilised the gathered images and drawing information and implemented them into multi-layering on preprints (see Figure 6 and Figure 7).

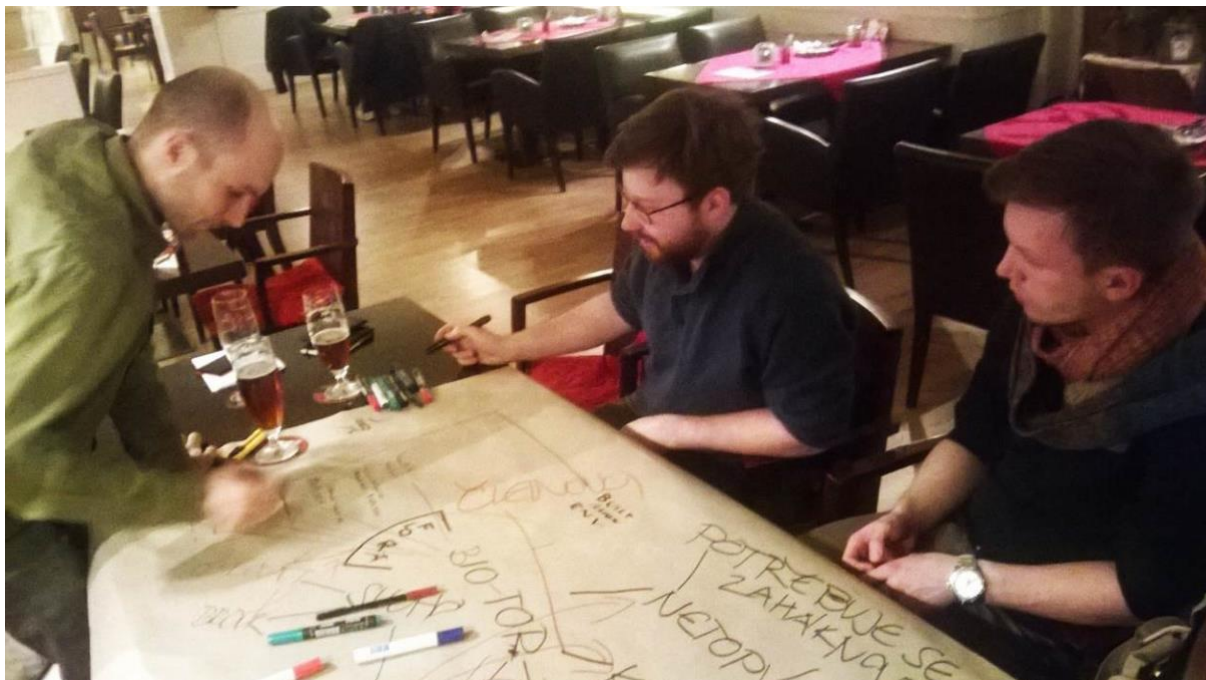


Figure 4. 1st GIGA-Mapping Workshop for the COLridor Project. In this case, this is an image of the Trans-Disciplinary Experts' Collective Mind Mapping (photo: Davidová 2017).



Figure 5. 2nd GIGA-Mapping Workshop for COLridor Project - combination of drawing and printed images correlating (photo: Davidová 2017).



Figure 6. Photograph taken shortly after the beginning of the third workshop (photo: Davidová 2017).



Figure 7. A detailed pre-printed map after the workshop that shows the timeframe planning of EnviroCity's events as well as the Eco-Systemic Performances (photo: Davidová 2017)

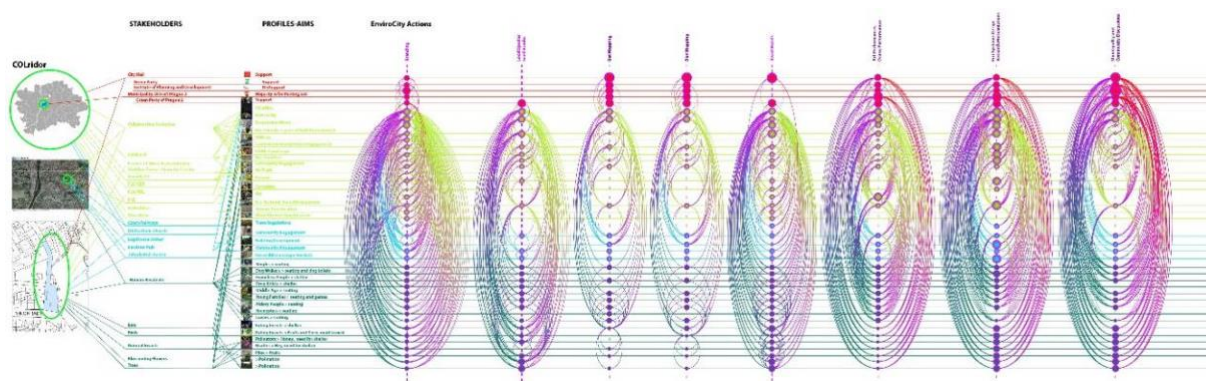


Figure 8. Speculative GIGA-Map relating the stakeholders' feedback looping the interactions within EnviroCity's actions and the scale of the locality they relate to (Davidová, 2017c) – Please see the reference for a preview of the full .pdf file.

The mapping for the interventions resulted in the concept design of the EnviroCity festival events and the insect hotel design for prototyping, both of which are discussed later in this article. The stakeholders with an interest in building development did not join the project; however, they actively followed it, and within the GIGA-Mapping processes, it was attempted to represent them through interpretations of their interests. All the gathered speculations on eco-systemic relations among stakeholders (including our team as well as local species), their aims and the designed interventions were digitally GIGA-Mapped and updated over time by the first author and were useful in understanding and leading the project (see Figure 8). The final map is relating the stakeholders' city scale activity areas and types, their interests and their preferences (see Figure 9 and Figure 10) as well as feedback looping among them related to the planned actions and activities (see Figure 11, Figure 12 and Figure 13). The relations were collectively mapped and speculated across the disciplines, the community and its political representations.

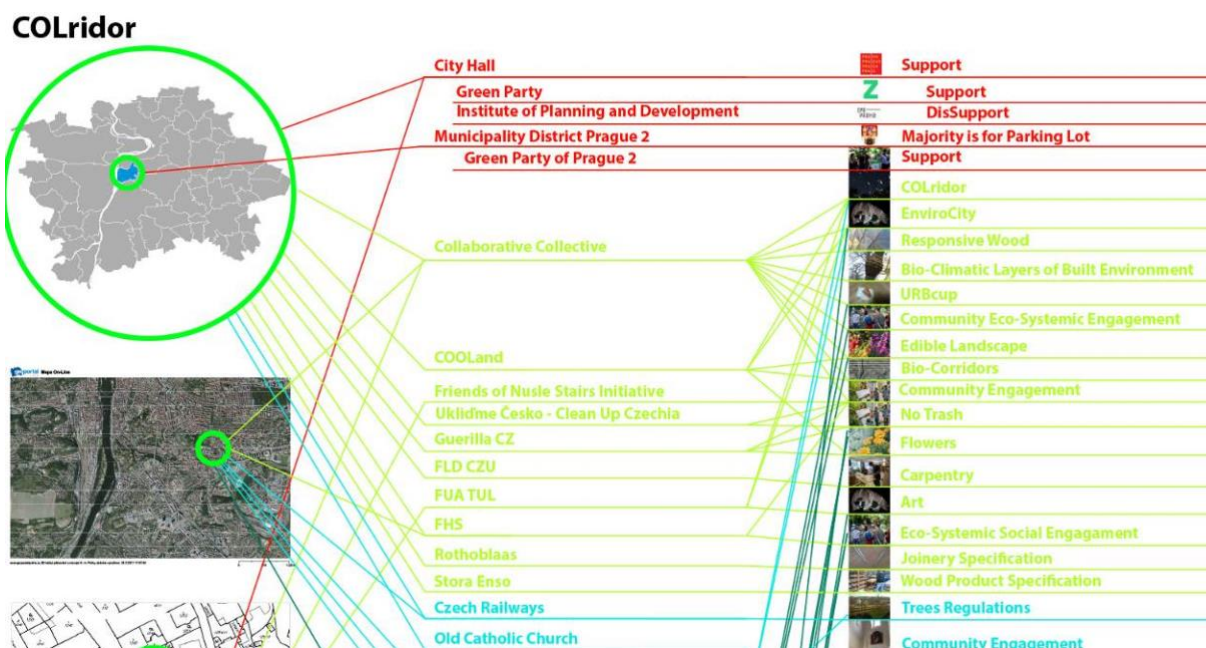


Figure 9. COLridor GIGA-Map's in detail that shows the stakeholders' city scale relations and interests and preferences in relation to the project. The stakeholders include those from the municipality, local authorities, local or engaged organisations and types of local residents. Please see the following figure with another detail to review the full list (Davidová 2017).

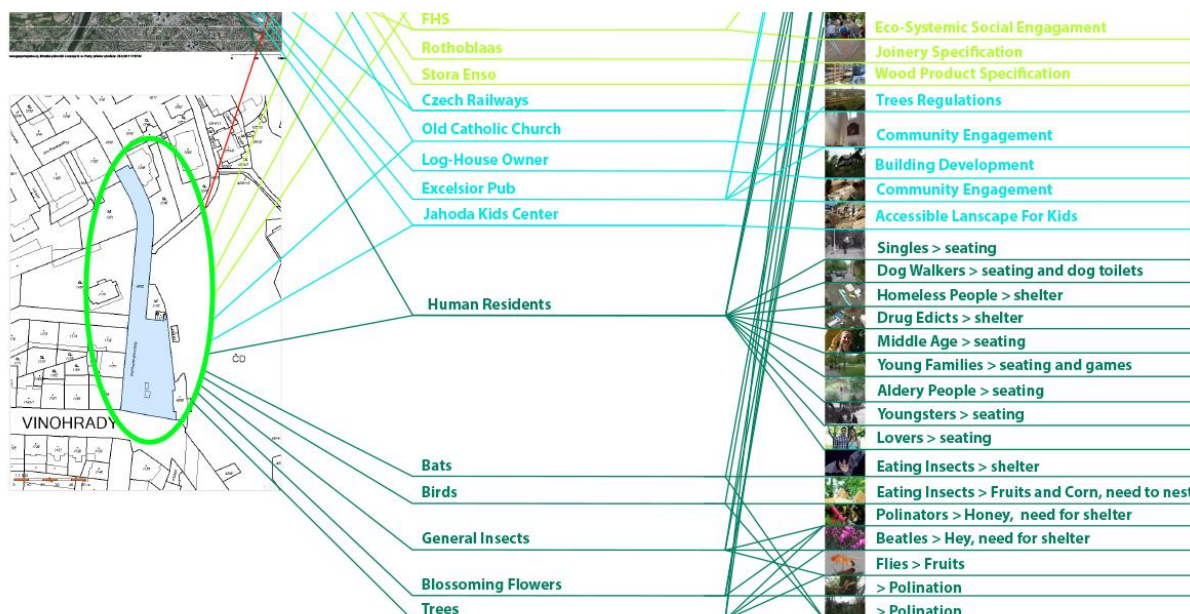


Figure 10. COLridor GIGA-Map's in detail that shows the stakeholders' city scale relations and interests and preferences in relation to the project. The stakeholders include from the municipality, local authorities, local or engaged organisations and types of local residents. Please see the above figure with another detail to review the full list (Davidová 2017).

EnviroCity Actions

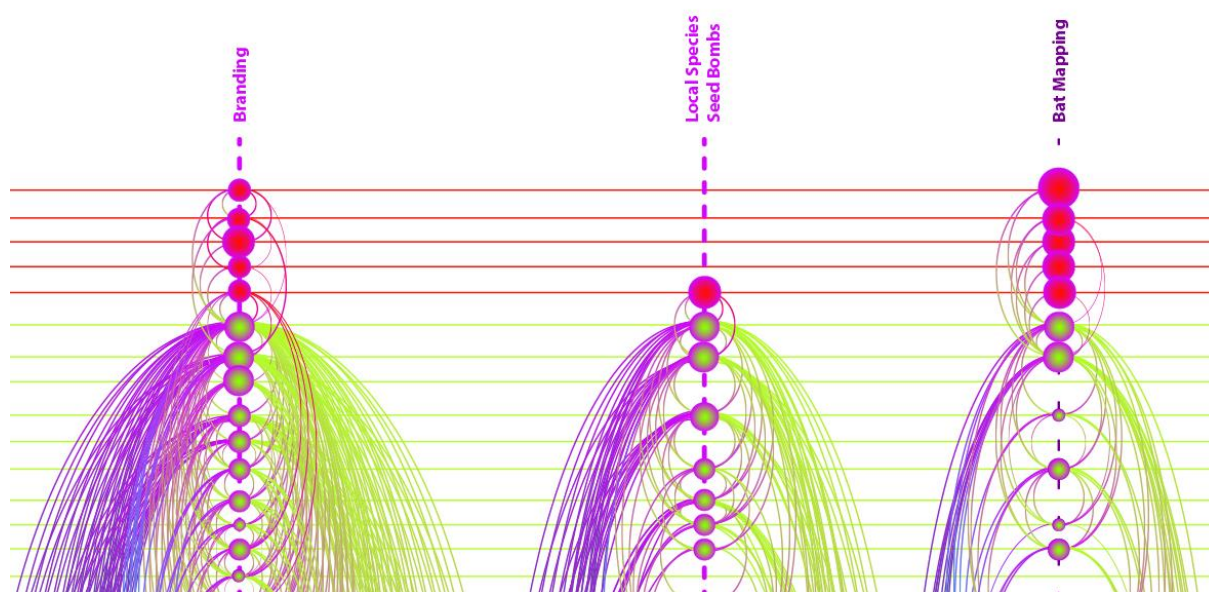


Figure 11. COLridor GIGA-Map in detail that shows some of the feedback looping related to the COLridor's and the EnviroCity's actions and activities within the project stakeholders' agency – please, see the following figures to review the full list (Davidová 2017).

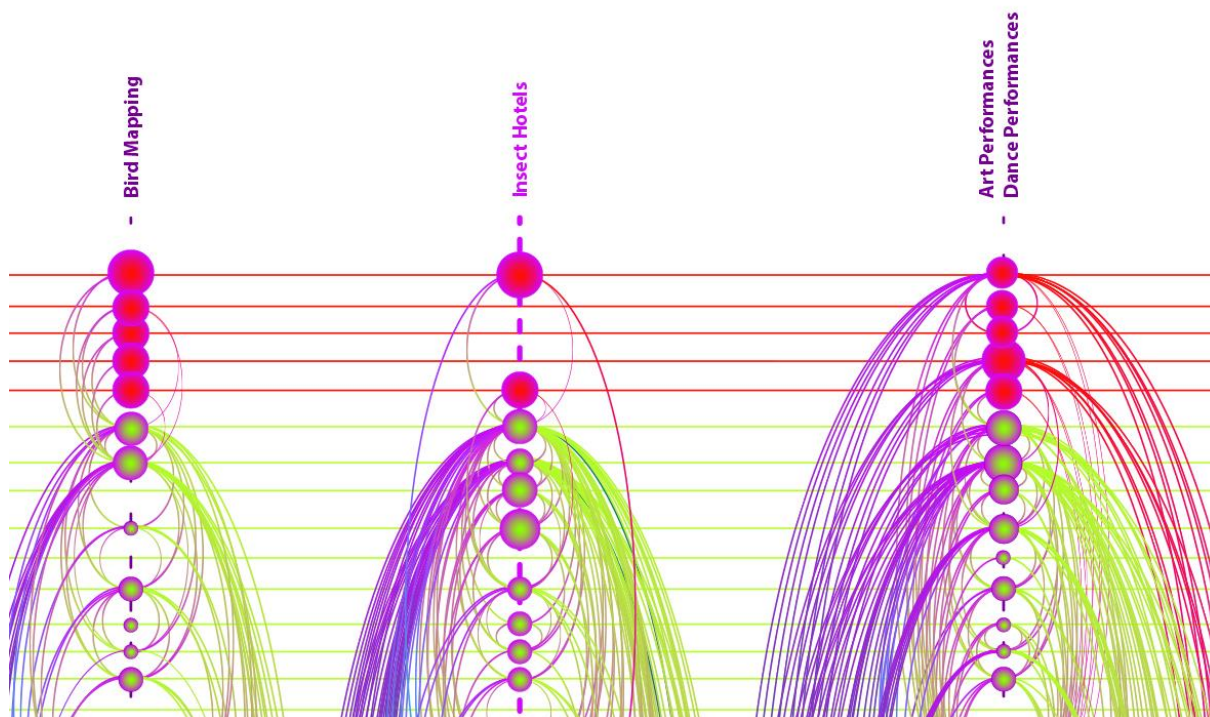


Figure 12. COLridor GIGA-Map in detail that shows some of the feedback looping related to the COLridor's and the EnviroCity's actions and activities within the project stakeholders' agency— please, see the above and below figures to review the full list (Davidová 2017).

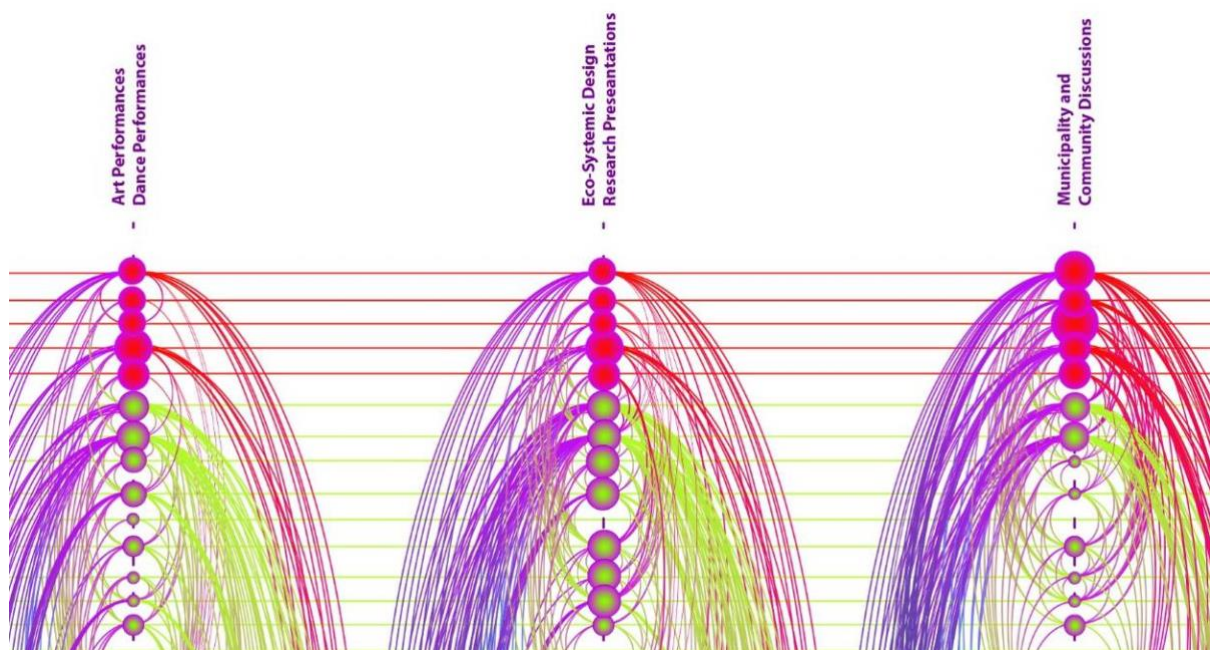


Figure 13. COLridor GIGA-Map in detail that shows some of the feedback looping related to the COLridor's and the EnviroCity's actions and activities within the project stakeholders' agency – please, see the above figures to review the full list (Davidová 2017).

The GIGA-map is still publicly exhibited in the garden of the restaurant. It performed as a discussion board during the EnviroCity festival, which is also discussed in the subsequent section. All attending stakeholders were interested in locating themselves on the map and following and discussing their relations to others. The analysis of relations also served as a tool for interactions and expectations as well as the branding of the events and actions. Therefore, it could be stated that the GIGA-Map is also an eco-systemic urban intervention that engages and generates the public co-design of the project.

EnviroCity Festival prototypes

The concept of the multi-genre EnviroCity Festival (Davidová & Kernová, 2016) is very open, though there is one strict rule: all performers (dancers, performing artists, AV artists, musicians, lecturers, workshops leaders, disputers, etc.) must have been somewhat related to the topic of the project. Therefore, the trans-disciplinary performers co-designed the project through their performance, the project's interpretation (Davidová, 2017d) and their influence on the audience. The fields consisted of local community ecological NGOs (see Figure 15), politicians (see Figure 14), social-geographers, architects (see Figure 19), national heritage architects (see Figure 14), systemic designers (see Figure 17), ecologists (see Figure 18) and biologists as well as dancers and performing artists (see Figure 16) and audio-visual shows (see Figure 20). Some performances were more interactive and some less, and some were either more or less research-oriented. Therefore, a broad range of ages and social groups became engaged and participated in the festival events. Even the owner, whose interests were related to development, observed the events through his window and often participated on-place, though not actively.

While the discussions among politicians and experts helped reach some solutions at the public agencies level, the artistic performances and ecological workshops, such as seed bombs and bird and bat mapping, included the audience through personal but public engagement. The research-oriented lectures engaged a more professional community in the research field. In addition, the knowledge generated through these performances had diverse characteristics. While researchers tend to provide in-depth explicit references, proposals regarding how to approach the issues and discussions, performing artists tend to communicate on tacit or even subliminal levels (see Figure 16 and Figure 20), all mainly relating to urbanised ground and/or its options for social situations. The NGO's brunch (see Figure 15), the community GIGA-Mapping workshop (see Figure 17), the interactive AV, AR and VR games for children (see Figure 19) and the political discussions (see Figure 14) allowed for exchanging specific local information and generated a sense of community togetherness. The physical seed bombing (see Figure 21) and the various types of species mapping (see Figure 18) offered learning through interaction, while Systems Oriented Design, environmental design, social geography and traditional architecture eco-systemic performative capacities references were also discussed. Although these prototypes often had no physical character, they all served as prototypical urban interventions, generating eco-systemic performance through co-design, whether through public or other means (seed bombs, etc.).



Figure 14. Debate on Bio-Corridors within the city and their relation to Bio-Top Zvonařka – the disputers consisted of a National Heritage Architect, City Hall Representative for Urban Development, Prague 2 District Counsel, the first author as an Architect and the second author as an Ecologist. The discussion had a stated goal to discover common strategies for action (photo: Robert Carrithers 2017).



Figure 15. Community brunch discussing Initiatives for Eco-Systemic Co-Living (photo: Robert Carrithers 2017).



Figure 16. Darina Alster: Sea Siren, Costume design: Darina Alster & Václava Davidová (Photo: Robert Carrithers 2017).



Figure 17. 'Who We Are / Who Are We' Community GIGA-mapping workshop by Linda Blaasvær (Photo: Robert Carrithers 2017).



Figure 18. Morning picnic with birds – Local Bird Mapping performed by Kateřina Zímová (photo: Robert Carrithers 2017).



Figure 19. VR game Bumblerun by Kateřina Horák Goryczka and Jan Horák in the public space of Nusle Stairs (photo: Robert Carrithers 2017).



Figure 20. Lunchmeat Eco-Systemic Closing Audio-Visual Performance (photo: Go 2017).

Eco-Systemic Urban Prototypical Interventions

The eco-systemic urban prototypical interventions inspired by CHORA's '*urban prototypical interventions*' (Doherty, 2005) can serve as an input stimuli for an eco-system to begin flourishing. For the COLridor project (Davidová, 2017b) with its festival EnviroCity (Davidová & Kernová, 2016), three interventions that were interlinked were categorised:

Edible Landscape

The project promotes the concept of an '*edible landscape*' (Creasy, 2004). For an eco-top to flourish, above all, there must be enough food. As birds and bats are crucial species to the location, an insect hotel was built (see Figure 22) to provide their food; however, this impending food must also be nourished, and there has been a nearly 80% decrease in flying insects since the 1980s in Western and Central Europe (Vogel, 2017). The situation for birds in Czech agricultural lands is similar (Czech Ornithologists Association, 2016b). Therefore, EnviroCity implemented a Seed Bombing workshop with blossoming flowers to offer honey (see Figure 21) for insects as well as fruits and seeds for birds. While doing so, this increase in the greenery surface intervention also addresses an '*urban heat island problematique*' (Wong, Hogan, Rosenberg, & Denny, 2016), thus supporting habitable and liveable environmental conditions that generate a richer edible landscape.



Figure 21. SeedBombs Workshop by Kateřina Zímová (photo: Robert Carrithers 2017).

Habitation

The first prototype for habitation is the insect hotel TreeHugger (see Figure 22). The hotel employs the concept of responsive, solid wood from Norwegian traditional architecture. This concept involves the tangential section through the tree trunk, and thus the fibre density on the left and right sides of the plank is different. Therefore, the plank warps in low relative humidity and high temperatures, while in humid, cold weather, it is narrow. When organised into a screen, the system airs in dry weather and closes in humid weather (Larsen & Marstein, 2000).

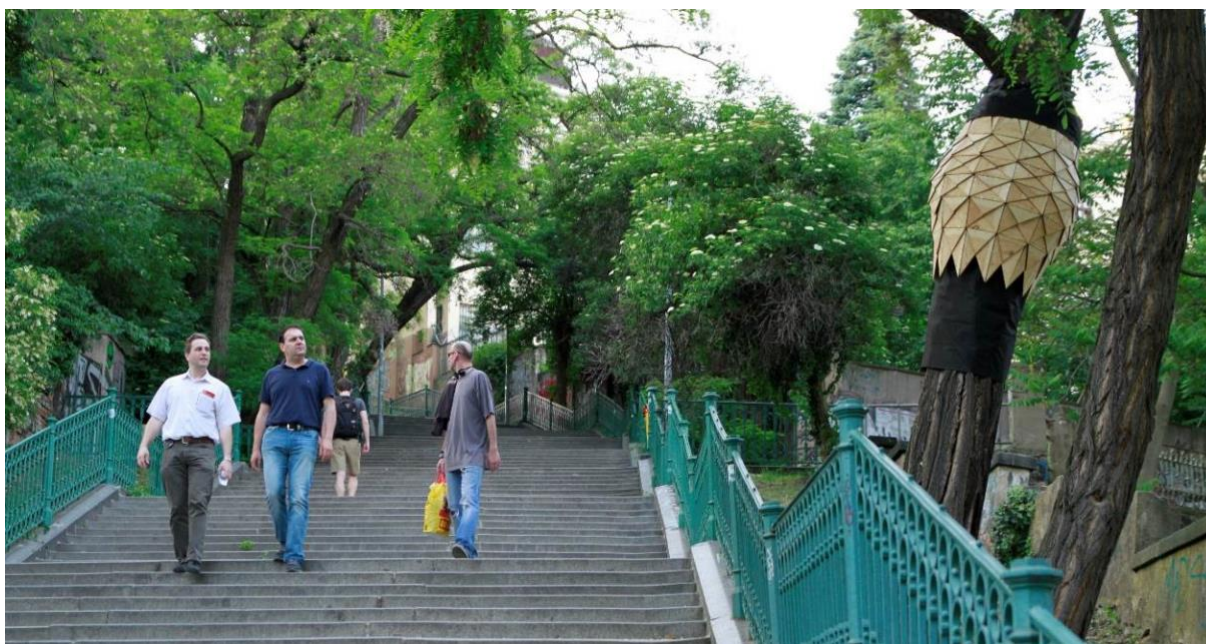


Figure 22. TreeHugger: Responsive Wood Insect Hotel that offers a variety of climatic and spatial conditions to be met with diverse insects' preferences. This is achieved by global axis orientation, the shape of the hotel and cutting the panels from different positions of the tree trunk. Please also take note of the social communication and engagement between people and the insect habitation architecture (photo: Robert Carrithers, 2017).



Figure 23. Ray 2 Responsive Wood Envelope Prototype: a) in semi-dry April weather when the screen is partly open for a boundary exchange between the exterior and the semi interior; b) After a light rain in April when the System is closed to prevent the humid and cold air from passing through the boundary; both after four years of exposure to weather and biotic conditions. The prototype became inhabited by Blue Stein Fungi, Algae and Lichen. These, especially the algae, regulate the moisture content of the wood, thus contributing to its warping. Notice also the organisation of the Algae habitation caused by the material's fibre direction and position within the design, which is affected by material performance and form. Thus, it is organised through its moisture and the organisms' abundance and distribution interaction (photo: Davidová 2017) (Davidová, 2017a).



Figure 24. The internal chambers of TreeHugger, which offers different climatic zones (photo: Davidová 2017).

This prototype is a further development of the first author's responsive wood screen Ray (Davidová, 2014b, 2014a, 2016a, 2017a) (see Figure 23) in which the warping is moderated based on the moisture content when the wood is cut. Certain positions within the tree trunk cause the differences in warping. The difference in warping not only enables the organisation of the panels' overlapping but also generates diverse climatic habitation chambers within the hotel (see Figure 24). Therefore, the hotel caters to a large diversity of insects and other species that are also supported by the terrain and world axis orientation. This wooden platform offers dwellings for algae, which also moderate its performance through moisture content (Davidová, 2017a, 2017d). Both the wood and the algae, performing together, also generate microclimatic performance (see Figure 25). By sorping⁸ the moisture at night when the relative humidity is high and by evaporating it on hot and dry summer afternoons, this intervention addresses an 'urban heat island problematique' (Wong et al., 2016), thus supporting habitable and liveable environment conditions. This insect hotel also serves as a fast –food restaurant for birds and bats. Therefore, the first responsive wood dwelling supports the bio-chain top down for pollination as well as bottom up for birds and bats.



Figure 25. TreeHugger inhabited by algae and other species after the winter. It is apparent that the prototype offers a material-climate performance, providing opportunities for dwellings for several species of fauna and flora (Davidová 2018).

Social interaction

Social interaction potentially has the most crucial impact on the ecosystem. Without public engagement, our mission will stagnate and cannot develop into the concept of sustainability, defined by Ehrenfeld as the possibility that humans and other life will flourish on the Earth 'forever' (Ehrenfeld & Hoffman, 2013). This impact through interaction was specifically increased through the EnviroCity festival discussed above. After receiving local as well as global public attention, open access to the TreeHugger Grasshopper⁹ model code was made available to download online on the Systemic Approach to Architectural Performance page (Davidová, 2016c) and shared the link with network. The project and its code can be adapted to local specific settings during workshops and through online recipes in other locations, such as in Prague or Cyprus, to exhibit the adaptation. This strategy of spreading a tested prototype through DIY¹⁰ when the public space is tagged through QR codes leading to the link to the manual and Grasshopper codes. This approach for spreading the applications proved to be the most efficient strategy for advancing the projects across communities to the first author: We could exemplify the project 'One More Tree' on communities growing trees in public space 'how to do manual' (Sidorová et al., 2013) or 'The Love to Landscape Proceeds through Stomach' sustainable farming support by city communities project organisation (Janovská, Zímová, Krčíková, Wranová, & Valeška, 2016). With this approach, the authors might reach somewhat of the 'butterfly effect'¹¹ through their social intervention initiation.

Eco-Systemic Performance Registrations and Observations

While performing all above, the time-based registrations and observations were tracked over time, beginning with the project's initiation and continuing to the present. This approach to 'learning by doing'¹¹ initiates Shön's 'reflection in action' (Schön, 1983), and during these performative processes, it therefore co-evolves into the 'Time-Based Design' (Sevaldson, 2004, 2005). Based on the observations, the complexity of the greenery consists of a mosaic of urban greenery, permanent grasslands, private gardens and ruderal stands along the railway line. The greenery is a varied species composition representing all floors from trees to herbaceous plants. Some trees have significant ecological importance due to their ages and habitats, especially trees in the private gardens on the streets Pod Zvonařkou and Na Klenovce. The complex greenery area is located on a sloping terrain; the entire site slopes down to the Botič stream and railway lines. The Zvonařka greenery complex, based on observations, is an ecological enclave in the middle of an urbanised environment. The site is ecologically valuable for several different reasons:

- The area is an important breeding and food biotope for birds and bats.
- The area is valuable due to its species diversity and the occurrence of nectar plants for pollinators, which are currently included among the highly vulnerable groups with a priority for protection according to the European Commission (European Commission, 2015).
- The location of the greenery area on a distinctive slope has a unique anti-erosion function, thus protecting lower-lying sites that are heavily urbanised.
- Greenery plays a positive role in the microclimate of the site, thus avoiding the temperature extremes typical within an urban environment.
- The site is the only corridor for species migration between adjacent systems of urban greenery.
- For Havlickovy and Folimanka Parks, these greenery systems have no other migration potential due to the heavily urbanised environment surrounding them.
- The area is crossed by the NRBK 40 bio-corridor.

- It is part of the concept of flood protection of MoE No. 11 - PPO Complex in the Lower Vltava River Basin in the section Štěchovice - Mělník, meaning the action Botič Revitalisation is covered. Due to its rich patricity, biomass concentration and slope location, the site has significant hydrological importance for water retention in the countryside and for protection from local flooding.

Biological Observations

A field survey was conducted from April 2017 to October 2017. During this survey, the entire site was explored in terms of functional ecological links outside the site and its interaction with the surrounding greenery. The collected field data were then compared with information from professional sources (AOPK, 2017) and subjected to an overall evaluation. Among the species identified, a total of 27 more common bird species and two more common listed bat species were observed (see Figure 26), and it was registered that they have no safe opportunities for nesting. Burnt nested bats were found in the baskets inside the heating exits of human dwellings. These observations can serve as a source for the next prototyping initiation. From the beginning of the project and the time of TreeHugger placement to the beginning of autumn, its slow inhabitation was recorded. It is currently assumed to be used by butterflies for overwintering, and this assumption can be tested in the spring when new seed-bombing is necessary. The increase in the larger eco-systemic chain is subject to long time span observations. These observations will be used to inform the project process and will be interpreted through upcoming GIGA-Mappings and eco-systemic urban intervention prototypes.

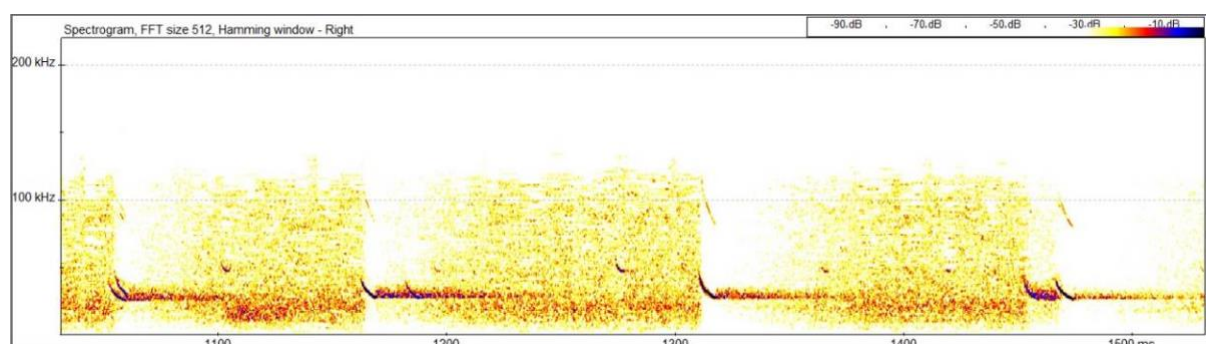


Figure 26. A sample from the Ultra Sound Bat Detector Recording registering two species of bats from the location (Bat Protection Association 2017).

Birds species registering (see Figure 18)

Contrary to exceptions, few rare species were observed; however, the site studies indicated the potential for the habitation growth and its landscape adaptation, which would provide a larger amount and range of nutrient and nesting opportunities that could change the situation, although determining this would require annual registering over a large time span.

Based on the observation on 31st May 2017, the following species were registered:

Phylloscopus collybita (see Figure 27), Phylloscopus trochilus, Turdus philomelos, Turdus pilaris, Columba palumbus, Delichon urbica (see Figure 28), Motacilla alba, Turdus merula, Sylvia atricapilla, Sylvia curruca, Sylvia communis, Fringilla coelebs, Falco tinnunculus, Phoenicurus ochruros, Garrulus glandarius, Carduelis carduelis, Pica pica, Dendrocopos major, Dendrocopos minor, Emberiza citronella, Troglodytes troglodytes, Parus major, Parus caeruleus, Sturnus vulgaris, Corvus corone, Carduelis chloris (see Figure 29) and Picus viridis.



Figure 27. *Phylloscopus Collybita*, which is a small singing bird that inhabits an area ranging from Western Europe to Siberia. It is mainly a migrating bird that originally nests in mixed forests with dense shrubs; however, recently, it has often been registered in green urban areas. While clearing pollution in Czech cities, its slight increase was recently registered (Czech Ornithologists Association, 2016a). It subsists on mainly insects. The photo is used with a creative commons licence from (Trepte, 2013).



Figure 28. *Delichon Urbica* babies nested in an urban settlement. These are small birds in an area ranging across Eurasia. Originally, they preferred open land with low vegetation, which usually includes pastures, meadows and farmland, preferably near water areas. Recently, they more often inhabit and nest in colonies in urban areas, as seen in the picture. They subsist on insects. The photo is used with a creative commons licence (Ableiter, 2007).



Figure 29. *Carduelis chloris* is a singing bird that inhabits mostly cultural landscapes of almost all of Europe except some parts of Scandinavia, Great Britain and Ireland. The population from the northern regions migrates. It subsists on seeds and insects. In Czechia, the population has extensively decreased since the year 2010 (Czech Ornithologists Association, 2016a). The photo is used with a creative commons licence (Thermos, 2006).

Bat species registering (see Figure 26)

The bat ultrasound registering tool captured signals of *Pipistrellus pipistrellus* (see Figure 30) and *Pipistrellus nathusii* (see Figure 31) on 14th May 2017. These are not the rarest local species; however, all Czech local bat species are protected and listed as endangered. Based on a more extensive area registration, it was concluded that these species use the particular location for hunting, not for nesting. They nest in larger parks on the discussed bio-corridor, and unfortunately, they often attempt to nest in the heating exits of urban areas in neighbourhoods. The lack of nesting opportunities leads to decreases in entire communities when the heating season begins. Therefore, the local bat monitoring report proposes to support a nesting and nutrient increase in this ecologically crucial locality (Zieglerová, 2017)



Figure 30. *Pipistrellus pipistrellus* is most likely the most common type of bat species in Czechia and Central Europe. Its habitat ranges from almost everywhere in Europe except the northern regions of Kashmir and Altaj. It requires either low or lower lands. It overwinters in caves or cellars, and in the summer, it nests in buildings and roof cavities. It lives in communities and subsists on insects. The photo is used with a creative commons licence (de Longe, 2005).



Figure 31. *Pipistrellus nathusii* is a migrating bat whose habitats range from Western Europe to Caucasus and Turkey. Of these regions, it is most common in Central Europe. It nests mainly in forests, and as its Czech name suggests, frequently in parks, both near water sources. It subsists on insects. The photo is used with a creative commons licence (Mnolf, 2006).

Summary

This case study demonstrates that the methodology and the ‘project’s result’ can be fused together within an ongoing time-based, real time, co-design performance. This involves both biotic and abiotic agency across the local specific eco-system, which acts in equal roles. The project combines the bottom up and the top down approaches for the generation of an edible, social, cultural and habitable urban environment across species and for the overall eco-systemic agency to reach a ‘*flourishing for all*’ (Ehrenfeld & Hoffman, 2013) state. In other words, the project discuss life, generating the situations to address several parameters: a) live (socially, culturally, etc.), b) dwell (climate comfort, etc.), c) eat and d) be eaten; flourishing eco-system across species performing together. A wild party, to say... The case study included multi-layered co-design approaches involving human and non-human actors and representatives within the initial and the performance co-design processes. All data are currently being registered, reflected and reused in forthcoming co-design processes. Therefore, as the project’s GIGA-Map shows, all its relations, interactions and evolutions occur due to rather complex, generative, time-based feedback loops.

Discussion and Conclusions

To ensure that ecological and various other site functions mentioned are preserved, it is necessary to keep the current green areas in the current state, November 2017. The site has the potential to provide a biotope for the observed common or rare or even protected species, such as bats, birds and insects. It is crucial that the site provides food and dwellings for them to

survive, especially because many are only adapted to living in an urban environment and because agricultural land is often even less conducive to their chances to survive.

Another problematique the project addressed by increasing biodiversity and blossoming green surfaces through social action is the urban heat island. Meineke, Dunn, Sexton and Frank (Meineke, Dunn, Sexton, & Frank, 2013) stated that heat can be a key driver of insect pest outbreaks in urban trees. Heat islands in cities could therefore be detrimental not only to climate change but also to biodiversity and vice versa. Thus, it is important to continue the observations and research of the diversity of pollinators and other insects, birds and bats that rely on them as well as blossoming plants in cities and to support those that are endangered or rare. Knop pointed out that urbanisation could have a negative impact on rare and specialist species (Knop, 2016). These species, along with others, are also disappearing from agricultural land due to pests, herbicides, etc. There are few types of land remaining in Central Europe other than mountain areas, and not all species have adapted to these areas. Specific solutions, such as COLridor, supporting specialist species that are typical for the biogeographic region through eco-systemic urban interventions could help increase local specific biodiversity. As local species begin to adapt to cities, the cities must adapt to this co-living situation as well to prevent an even larger biodiversity loss.

The project clearly requires larger and longer time span observations and interventions; however, it is already clear that to achieve the proposed objectives, it is necessary to involve both bio-technological research as well as the local human community in the vision to co-design the urban environment and to cohesively inhabit it along with other species. The media mix of both GIGA-Mapping and prototypical actions adapted to momentary research investigations appear to be effective design-research tools. Their performance should be perceived as both the design process and the ‘over-evolving’ design results-prototypes within the eco-systemic co-design and re-design performance for co-living situations in urban environments. Therefore, it is claimed that designing with- rather than designing for- should be performed. It is alarming that the UN agenda for 2030 sustainable development is calling for a collaborative partnership between all stakeholders to eradicate poverty while determining to ensure that economic, social and technological progress occurs in harmony with nature to reach prosperity (United Nations, 2015); however, its goals are so anthropocentric that ‘*Cities and Communities*’ are discussed as a separate goal (United Nations, 2015, 2016a) from bio-diversity and are discussed in relation to the ‘*Life on Land*’ goal (United Nations, 2015, 2016b). These goals are not in any sense cross-referenced. As opposed to this human-centred approach, this project demonstrates the relevance of considering human settlements as part of and taking part in the overall eco-system. Based on this small case study, it is apparent that it is not possible to achieve social justice without environmental justice and vice versa. This is because humans play full and equal—neither privileged nor pejorative—roles within the overall eco-system and biosphere. This fact cannot be neglected to shift from Anthropocene towards the sustainable co-living futures of Ehrendfeld’s ‘*flourishing for all*’ (Ehrendfeld & Hoffman, 2013).

Through the generation of public awareness and pride for the local specificity and community, the bio-corridor can be marked into the metropolitan plan, and no future building development in the precious garden would be permitted. At the same time, the aim is to achieve a broader impact on other communities around the world by spreading awareness of the project through social media using a DIY strategy that should be adapted to the local eco-systemic, including natural, social and cultural environmental settings, by its appliers. Through this multi-layered ‘*Ecological Urbanism*’ that involves ‘*anticipation, sensing, curation, collaboration, production, interaction, mobilisation, measures, adaptation and incubation*’ (Mostafavi & Doherty, 2016b, 2016a), our policies are targeted to be implemented from the bottom up. The fusion of the discussed eco-systemic co-design performances and the processes involved in co-

living justify the relevance of the recent ratification of the Systemic Approach to Architectural Performance design field.

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¹ 'Biotope: A region that has a characteristic set of environmental conditions and consequently a particular type of fauna and flora (biota)'. (Oxford University Press, 2004)

² 'A point of particular significance is that local extinctions are common events (see Section 7.5), and thus the recolonization of habitat fragments is critical for the survival of fragmented populations. Thus, particular attention should be paid to the spatial relationships amongst fragments, including the provision of dispersal corridors. There are potential disadvantages. For example, corridors could increase the correlation among fragments of catastrophic effects, such as the spread of fire or disease, but the arguments in favour are persuasive'. (Begon, Harper, & Townsend, 2006)

⁵ 'Environment is the physical and biological surroundings of an organism. The environment covers non-living (abiotic) factors, such as temperature, soil, atmosphere and radiation, and also living (biotic) organisms, such as plants, microorganisms and animals'. (Oxford University Press, 2004)

⁶ The division between '*participatory design*' and '*co-design*' is used here in the meaning as discussed by Sanders and Stappers (Sanders & Stappers, 2008) and it is commonly used in Central Europe in this sense. In this sense, participation means that the related stakeholders are invited to the discussion board, while co-design means 'co-creation' (Sanders & Stappers, 2008), where the stakeholders play a creative, active role within the design process as co-authors.

⁷ Ecosystem was described by Allen and Roberts as an ecological system inside the system that includes the geophysical part (Allen & Roberts, 1993).

⁸ 'Sorption; is a word used in wood material science that refers to the absorption of any vapour or liquified matter by a fibre.

⁹ 'For designers who are exploring new shapes using generative algorithms, Grasshopper® is a graphical algorithm editor tightly integrated with Rhino's 3-D modelling tools. Unlike RhinoScript, Grasshopper requires no knowledge of programming or scripting, but still allows designers to build form generators from the simple to the awe-inspiring'. (Davidson, 2017)

¹⁰ DIY means 'do it yourself'.

¹¹ Learning by doing refers to a theory of education expounded by American philosopher John Dewey. He theorised that learning should be relevant and practical, not just passive and theoretical. He implemented this concept by establishing the University of Chicago Laboratory School. (Pegg, 2018)